Participating in the Webinar

All attendees will be muted and will remain in Listen Only Mode.

Type your questions here so that the moderator can see them. Not all questions will be answered but we will get to as many as possible.
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ACG will send a link to a CME & MOC evaluation to all attendees on the live webinar.

ABIM Board Certified physicians need to complete their MOC activities by December 31, 2020 in order for the MOC points to count toward any MOC requirements that are due by the end of the year. No MOC credit may be awarded after March 1, 2021 for this activity.

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Include specific strategies or changes that you plan to implement. THESE ANSWERS WILL BE REVIEWED.

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David A. Greenwald, MD, FACG
December 22, 2020 at 8pm Eastern

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Paul Y. Kwo, MD, FACG
January 7, 2021 at Noon Eastern
Visit gi.org/ACGVGR to Register
Choledochal Cysts: Recognition and Management

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Oakland University William Beaumont School of Medicine

Disclosures:

Speaker:
Laith H. Jamil, MD, FACP
Dr. Jamil has no conflicts of interest related to this talk.

Moderator:
Grace E. Elta, MD, MACG
Consultant: Olympus Medical

COVID-19 Vaccines: Key Information for Gastroenterologists

WEBINAR
TUESDAY, DEC. 22nd (8 to 9:30pm EST)
Moderator:
David A. Greenwald, MD, FACP, ACG President
Presidents:
Freddy Cohen, DO, MS
Francis A. Groop, MD, ASC, MACG
Mary Haynes, BPH, PA, MPH, BCPS
Jonathan L. Totta, MD, PHD, MS
Register: gi.org/ACGVGR

American College of Gastroenterology
Objectives

- Identify the various types of choledochal cysts (CC)
- Identify their management options

Definition of CC

- Congenital anomalies of the biliary tract that are manifested by cystic dilatation of the extrahepatic and/or intrahepatic bile ducts
- Single or multiple
- Also termed Congenital Biliary Dilation, Biliary cysts, or Bile Duct Cysts (BDC)
- Bile duct dilatation: a maximum diameter of the extrahepatic bile duct was ≥ 10 mm in adult patients, 5 mm in 10-year-old pediatric patients, and 4 mm in 5-year-old pediatric patients by radiographic studies

Case

- 63-year-old male with history of lymphoma presents with Acute Pancreatitis
- CT scan: lymphadenopathies and an infiltrating mass in the liver
- Liver biopsy: moderate to poorly differentiated adenocarcinoma, likely PB or GI primary
- Subsequently developed abnormal LFTs
Pancreaticobiliary Maljunction (PBM)

- AKA Abnormal Pancreaticobiliary junction (APBJ)
- Union of the BD and PD outside the duodenal wall with a long common ductal channel (> 8 mm)
- Seen in 10-58% of CC
- CC are seen in 75% of PBM
Komi Classification

- **Type I (BD type):** A narrowed common bile duct joins the pancreatic duct at a right angle
- **Type II (PD type):** A pancreatic duct joins the common bile duct at an acute angle
- **Type III (Complex type):** It is complicated by a patent accessory pancreatic duct
- A dilated common channel or accessory PD could be the cause of relapsing pancreatitis

PBM

- Japanese Study
  - Prospective investigation in asymptomatic individuals undergoing medical checkups
  - Overall incidence 0.03% (9/27,076 subjects)
  - 23% of cases with bile duct dilatation
  - 2.9% with gallbladder wall thickening

Pathophysiology of PBM

- Pancreatic juice reflux and invasion to the bile duct
- Biliary tract cause, Cholecystitis
- Bile reflux and invasion in the pancreatic duct
- Pancreatitis
- Duodenal wall
- Sphincter of Oddi
PBM and Benign Disorders

- Gall Stones
  - 17.9% of patients with CC (more in the bile duct)
  - 27.3% of patients without biliary dilatation (more in the GB)
- Adults > Pediatrics
- Bilirubinate gallstones most frequent
- Chronic Pancreatitis: 5.8%

PBM and Cancer

- Carcinogenesis explained by reflux and stasis of bile mixed with pancreatic juice in the bile duct and GB
- Significantly more K-ras mutations and p53 overexpression possibly due to biliopancreatic reflux
- The sequence of hyperplasia–dysplasia–carcinoma is regarded as the prevailing mechanism

PBM and Cancer

- PBM without CC: High incidence of GB cancer (36%); Strongly consider
  - Prophylactic cholecystectomy
  - Extrapancreatic bile duct resection/cholecystectomy
- PBM with CC: Increased incidence of Cholangiocarcinoma and GB cancer
• 96 patients with GB cancer and 65 patients with PBM (15 mm) were studied
  – PBM incidence: 16.7% in GB cancer, 2.8% among 641 consecutive patients without GB cancer
  – GB cancer incidence:
    • 1.9% among 635 patients with normal PBJ
    • 24.6% in patients with PBM (10 patients)
    – 73.3% (8/11) without CC

Kimura K et al. Gastroenterology. 1985 Dec;89(6):1258‐65

PBM and Biliary Cancers

The Japanese Study Group on PBM
1627 patients with PBM over 10 years (600 adults)

<table>
<thead>
<tr>
<th>Patients and Patients</th>
<th>With CC (n=137)</th>
<th>Without CC (n=484)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult patients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GB in biliary tract</td>
<td>63.8%</td>
<td>47.3%</td>
</tr>
<tr>
<td>GB in incidental BD cancer</td>
<td>66.0% vs 45.8%</td>
<td>76.3% vs 8.8%</td>
</tr>
</tbody>
</table>


PBM and Biliary Cancers

The Japanese Study Group on PBM
2561 patients with PBM over 18 years
Adults 1511, pediatrics 1018 (32 excluded)
One pediatric case of bile duct cancer (PBM with CC)

<table>
<thead>
<tr>
<th>Adult patients (n=1511)</th>
<th>With CC (n=977)</th>
<th>Without CC (n=514)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bile duct cancer</td>
<td>6.9%</td>
<td>3.1%</td>
</tr>
<tr>
<td>GB cancer</td>
<td>13.4%</td>
<td>37.4%</td>
</tr>
</tbody>
</table>
PBM and Pancreatic Cancer

- Unknown
- Incidence of pancreatic cancer in Japan
  - General population: 0.00262 %
  - Patients with PBM: 0.8% (49.4-fold increase)

Recommendations for Patients with PBM

- Once the diagnosis of PBM is established, immediate prophylactic surgery is recommended
- However, the surgical strategy for PBM without biliary dilatation remains controversial
  - Prophylactic choledocotomy:
    - Extrahepatic bile duct resection/cholecystectomy
- To detect PBM without biliary dilatation early, MRCP is recommended for patients showing gallbladder wall thickening on screening US under suspicion of PBM

Classification of Choledochal Cysts (CC) According to Todani and Colleagues

- I (A): common type; (B) segmental dilatation; (C): diffuse dilatation
- II Diverticulum
- III Choledochocèle
- IV Multiple cysts; (IV-A) intra- and extrahepatic; (IV-B): extrahepatic
- V Single or multiple dilatations of the extrahepatic ducts (Santorini disease)
Epidemiology

• Incidence
  – Asia: 1:1000
  – North America is 1:150,000 live births
• F:M distribution: 3:1 to 4:1
• Age distribution: Children>>>adults (20%)

Biliary Cyst Presentation

• Incidental: Imaging, prenatal ultrasound, or endoscopy
• Neonates: cholestatic jaundice, acholic stools, vomiting, irritability, failure to thrive, hepatomegaly, abdominal mass
• Children and adults: triad of abdominal pain, jaundice, and a palpable mass (<20%)
• Abdominal pain > adults, jaundice >children
• Older patients: Pancreatitis and recurrent cholangitis
• The male-to-female ratio is approximately 1:3, and it is especially predominant in young women

Work Up

• LFTs often normal unless complication e.g. cholangitis, pancreatitis, stone, stricture, tumor, etc.
  – Cross-sectional imaging (MRI/MRCP preferred)
    – Confirm cyst/type
    – Assess if cyst communicates with the biliary tree
    – Associated mass?
    – Assess PBJ
• High index of suspicion: Dilated bile duct or cystic liver lesion(s)
MRCP vs ERCP for Choledochal Cysts

- 8-year, 72 patients, retrospective study
- All patients underwent both MRCP and ERCP
- MRCP findings were compared with those of ERCP as the criterion standard
- Overall detection rate of MRCP for
  - Choledochal cysts: 96% (69/72)
  - Ductal anomalies (57%): sensitivity (83%), specificity (90%), accuracy (86%)
  - Choledocholithiasis: 100% (8/8)
  - Concurrent Cholangiocarcinoma: 87% (13/15)

<table>
<thead>
<tr>
<th>Type of Patients</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I (31)</td>
<td>85</td>
<td>90</td>
<td>86</td>
<td>86</td>
</tr>
<tr>
<td>Type II (15)</td>
<td>75</td>
<td>200</td>
<td>50</td>
<td>95</td>
</tr>
<tr>
<td>Type III (10)</td>
<td>90</td>
<td>90</td>
<td>91</td>
<td>91</td>
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<tr>
<td>Type IVa (5)</td>
<td>90</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Type IVb (1)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Type V (5)</td>
<td>100</td>
<td>100</td>
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</tbody>
</table>

Risk of Malignancy

- 20-30-fold ↑ risk of Cholangiocarcinoma
  - Type I and type IV cysts show a higher incidence, even after cyst excision
  - Gall bladder
  - ??? Pancreatic Cancer
  - Incidence: 10–30% of adults (mean age 32)
  - Overall risk of cancer 10-15%
    - 0.7% < 10 years of age
    - 7% 11–20 years of age
    - 14% >20 years of age
    - As high as 50% in older patients

Park DH et al. GIE 2005;62(3):360
1. **CC And Associated Malignant Tumors In Adults**
   - 808 patients ≥ 18 years who underwent surgery for CC over 17 years in S Korea
   - Biliary tract malignant tumor was associated in 80 patients (9.9%):
     - bile duct cancer (40 Pts, 50.0%)
     - gallbladder cancer (35 Pts, 43.75%)
     - periampullary cancer (5 Pts, 6.25%)
     - synchronous gallbladder and bile duct cancer (1 Pt, 1.25%)

2. **Factors Predicting Malignancy**
   - Univariate Analysis:
     - > 40 years of age
     - absence of a gallstone
     - ↑ CEA or CA 19-9 serum level
     - presence of PBM
   - Multivariate analysis: ↑ CA 19-9 level

3. **Type of CC and Malignancy**
   - Type I 68%
   - Type II 5%
   - Type III 1.8%
   - Type IV 21%
   - Type V 6%
Non-Malignant Complications

- Stone formation: Cystolithiasis, choledolithiasis, choledocholithiasis, hepatolithiasis
- Cholangitis
- Secondary biliary cirrhosis
- Pancreatitis

Unusual Non-Malignant Complications

- Intraperitoneal cyst rupture
- Bleeding
- Gastric outlet obstruction
- Intussusception

Case

- 23 year old female
- Intermittent RUQ, epigastric and lower quadrant pain, plus nausea of 4 months duration
- MRI P.
Case

- 61 year old female presents to an OSH with AP
- Imaging showed distal biliary stricture with upstream dilation of 3.5 cm. LFTs elevated
- Working Dx: distal CBD stricture
- ERCP performed with stent placement
- 1 week later worsening pain
- EUS: No pancreatic mass, normal distal CBD

MRCP

Case

- 12 year old female presents with abdominal pain
- Imaging: acute appendicitis and focal dilation of the bile duct (17 mm)
- MRCP
Type 1 Choledochal Cysts

- Most common type
  - 65%-84% in Eastern cohorts
  - 67%-73% in Western cohorts
- Has no intrahepatic component
- The common hepatic duct proximal to the cyst is usually normal

Type Ia
- Cystic dilation involves the CBD, part or all of the CHD and extrahepatic portions of the L&R HD
- Associated with a PBM

Type Ib
- Focal, segmental dilation of an extrahepatic bile duct (often the distal CBD)
- Not associated with a PBM
Type IC

- Smooth, fusiform, diffuse, or cylindrical dilation, usually from the PBM to the extrahepatic portions of the L&R HD
- Associated with a PBM

Cancer in Type 1

- European study, 350 patients with CC, Pancreaticobiliary junction (PBJ) was analyzable in 263
  - 190 (72.2 %) had PBM. Similar rate in Types I and Iva
- 131 patients with Type 1 CC, 73% with PBM
- Incidence of synchronous cancer 9.1% (12/131)
  - With PBM: 10.5% (12/112)
  - Without PBM: 5.7% (2/35)

Management

- Obstructive lesion ?→ EUS &/or ERCP
- Distal Margin:
  - Preop: MRCG, EUS, &/or ERCP
  - Intraop: Cholangiography, choledochoscopy
Surgical Management

- Complete excision of the cyst: from the bifurcation of lobar HDs into the parenchyma of the pancreas near the junction of the PD
- Coupled with cholecystectomy
  - Biliary tract continuity
    - Roux-en-Y hepaticojejunostomy (HJ)
    - Hepaticoduodenostomy (HD)
    - Jejunal interposition HD

Type II

- True choledochal diverticula arising from the extrahepatic duct
- Communicate with the bile duct through a narrow stalk
- 2% of biliary cysts

Management

- DDX: pancreatic, mesenteric, and hepatic cysts
- If in doubt about dx → hepatobiliary scintigraphy or ERCP
- Treatment: Surgical excision of the cyst
Case

- 87-year-old female presents with epigastric pain
- Abdominal US: 14mm CBD, GB sludge/stones
- LFT: ALP 436, AST 218, ALT 287, T bili 3.4, WBC 12.2
- MRCP

Type III (AKA Choledochoceles)

- Cystic dilations are limited to the intra-duodenal portion of the distal CBD
- 1-5% of all CC
- Average age at presentation: 51 years
- Lining: duodenal epithelium or biliary epithelium (increased risk of malignancy)
- Several subtypes
- Incidence of malignancy: 2.5% in symptomatic choledochoceles

Law R, Topazian M CGH 2014;12:196-203
Most Common Types

• Type A: The intramural bile duct opens into a cystically dilated segment, which communicates to the duodenal lumen via a separate orifice
• Type B: The bile duct that opens normally into the duodenal lumen, with the choledochocoele arising as a diverticulum of the intra-ampullary common channel

Duodenal Duplication Cysts

• Cystic structures typically found in D2 and D3
• Intimately attached to the duodenal wall
• They have a muscle coat
• Almost 50% of duodenal duplications communicate with the periampullary ducts, often to the pancreatic duct, and at times via an aberrant duct

Management

• Symptomatic: Treat
• Asymptomatic:
  – Type IIIA: Endoscopic sphincterotomy (followed by biopsy of the cyst epithelium), and/or endoscopic snare resection
  – Type IIIB: Surgical or endoscopic resection via polypectomy snare
• Follow up: Endoscopic biopsies of the cyst mucosa a year later (assess for dysplasia)
Case

- 65-year-old Korean male post cholecystectomy presented with RUQ pain and fever
- LFTs normal except
  - AP 713 U/L (n≤120)
  - WBC 15.5
- MRCP: Liver abscess

2 Years Later

- Progression of intrahepatic and extrahepatic bile duct dilation
- LFTs Normal except
  - AP 183 U/L (n≤120)
  - ALT 50 U/L (n≤47)

Type IV

- Multiple cysts
- 15-35% of CC
- Type A: Both intrahepatic and extrahepatic cystic dilations
  Associated with PBM
- Type B: Multiple extrahepatic cysts only
- Malignancy Risk: 21%
Type IV and PBM

- European prevalence: IVa 36/52 (69.2%), IVb 4/5 (80%)
- Incidence of biliary cancer among patients with CC IV with PBM was 25% (1 out of 4 patients)


Management

- Surgical excision and creating a Roux-en-Y hepaticojejunostomy
- If previously managed by a cystenterostomy for symptomatic relief → surgery (30% post cystenterostomy risk of malignancy)

Jabłonska B. World J Gastroenterol. 2012 Sep 21;18(35):4801-10

Symptomatic Residual Intrahepatic Cysts Type IV A

- If patient becomes symptomatic from residual intrahepatic cysts
  - Segmental hepatectomy
  - Surgical lien-roofing
  - Liver transplantation in some cases

Yamada T et al. J Nippon Med Sch. 2009 Apr;76(2):103-8

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Timing in Neonates

- Unclear
- Early surgical intervention if
  - Progressive intrahepatic ductal dilation
  - Cyst enlargement
  - Deterioration of liver function
- Harbingers of obstruction and/or cholangitis
- External drainage procedures (as a bridge)
  - Nutritional compromise
  - Acute infection

Clifton MS et al Pediatrics 2006;117:e596‐e600

Timing of Surgery

- Three patient groups that had been operated:
  - < 1 year old (group I, n = 26) significantly fewer surgical complications and less severe liver fibrosis
  - 1–16 years old (group II, n = 48)
  - > 16 years old (group III, n = 33)


Surgical Outcome

- Postoperative morbidity (2.5%‐27%)
- Mortality [0%‐6%]
- Late AEs:
  - Most common: Biliary-enteric anastomosis stricture
  - Less common: peptic ulcer disease, cholangitis, biliary and intrahepatic stones, pancreatitis, liver failure and biliary cancer

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Patient with Previous Cystenterostomy

• If previously managed by a cystenterostomy → surgery (30-50% post cystenterostomy risk of malignancy)
• Japanese study: 3/8 patients developed 2nd carcinoma
  – Mean age at detection of carcinoma 15 years, 15 years less than that of primary carcinoma
  – The mean interval between drainage and detection of carcinoma was 10 years
• European Study: 8% (27/350) CC patients developed cancer
  – Previous enterocystic derivation was present in 6/27 (22%) patients with cancer
  – The median age of patients with cancer after cystenterostomy was 43.1 years (range 25–60 years)

Bile Duct Cancer Developed After Cyst Excision For Choledochal Cyst

• 23 patients with cholangiocarcinoma after excision of CC
• Incidence: 0.7%
• Nearly half of the 23 patients in the literature had undergone inadequate cyst excision
• Intervals between cyst excision and cancer detection: 1-19 years (average, 9.0 ± 5.5 years)
• Sites of cancer development: intrahepatic (6); anastomotic (8); hepatic side residual cyst (3); and the intrapancreatic duct (6)
• All patients with CC also require life-long follow-up for cancer, usually via serial ultrasonography and monitoring of liver enzymes

Follow Up

• No clear guidelines
• Post-excisional malignant disease: 0.7-6 %
• Type III cysts treated with endoscopic sphincterotomy: Endoscopic biopsies of the cyst mucosa a year later
• Frequency of post total cyst excision (6-12 months?):
  – LFTs to screen for anastomotic biliary stenosis (25%)
  – CEA and CA 19-9 ?
  – Abx (2)
• 33.3% risk of malignancy in patients with incomplete cyst resection compared with 6% after complete cyst resection
Non-Surgical Management
Type I, II, or IV

- Periodic imaging: Unproven value
- Can consider yearly imaging studies (MRI/MRCP, CT with contrast, or IDUS), particularly if findings will alter patient management
- Patient who refuse surgical resection/poor surgical candidates
  - Laparoscopic cholecystectomy
  - Endoscopic sphincterotomy
  - Endoscopic stent placement

Case
- 84-year-old male
- Presents with flank pain and hematuria
- Imaging showed kidney cysts and liver cyst
- MRI/MRCP

Case
- 30-year-old male with presumed cirrhosis secondary to congenital hepatic fibrosis
- Presents with abdominal pain, fever and mild abnormalities in LFTs (TB 1.7, AP 155)
Type V

- Single or multiple intrahepatic cystic dilations alone (no associated strictures)
- 20% of these cysts
- Caroli disease
  - Less common
  - Without other apparent hepatic abnormalities
  - Usually presents with recurrent cholangitis
- Caroli syndrome
  - More common
  - Associated with congenital hepatic fibrosis

Carolí’s

- Autosomal recessive (reports of autosomal dominant inheritance)
- Associated with autosomal recessive polycystic kidney disease (ARPKD)
- Non-obstructive Saccular or fusiform dilatation of bile ducts → stagnation of bile → biliary sludge and intraductal lithiasis
- Bacterial cholangitis – sepsisemia and hepatic abscess formation
- Secondary biliary cirrhosis can occur due to biliary obstruction

Carolí’s

- Incidence: 1 in 1,000,000 population
- Males and females are equally affected
- > 80% of patients present before age 30
- Carolí’s syndrome patients can present with portal hypertension and its sequelae
**Diagnosis**

- Imaging (MRCP)
- Rarely need liver biopsy
- Central dot sign: The fibrovascular bundles containing portal vein radical and a branch of hepatic artery bridging the saccule

**DDX**

- PSC: ductal dilation rarely saccular, tends to be more isolated and fusiform, IBD association
- Recurrent pyogenic cholangitis: Saccular dilation unusual
- Polycystic liver disease: cysts rarely communicate with the bile ducts

**Management**

- Largely supportive (antibiotics, ERCP, cholangioscopy, EHL, ESWL)
- Hepatic resection: Disease limited to a single lobe
- Liver transplantation: Extensive disease and frequent complications
Ursodeoxycholic acid in Caroli’s Syndrome

- 12 patients with Caroli’s syndrome and intrahepatic stones
- The duodenal bile of these patients contained cholesterol crystals
- Ursodeoxycholic acid 10-20 mg/kg daily
- Results after 48 (range 12-114) months
  - sustained clinical remission
  - return to normal liver function
  - dissolution of intrahepatic stones on ultrasound in all patients (9 partial, 3 complete)


Take Home Points

- High index of suspicious in unexplained cystic dilations of the biliary tree
- High risk for malignancy
- Patients with PBM are at increased risk for GB cancer → strongly consider Cholecystectomy
- Cancer screening: Not proven

Take Home Points

- Type I → Surgery
- Type II → Surgery
- Type III → Endoscopic therapy
Take Home Points

- Type IV → Surgery
- Type V → Supportive/symptomatic treatment. May require surgery/liver transplantation
- Consider post surgical FU

Thank You

Questions?

Speaker:
Laith H. Jamil, MD, FACG

Moderator:
Grace H. Elta, MD, MACG